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MATTER, INSTINCT, MIND:

THEIR NATURE AND RELATIONS.

THE CLOSING LECTURE

OF THE

SECOND ANNUAL COURSE OF LECTURES

BEFORE THE

MARYLAND INSTITUTE OF EDUCATION.

BY N. C. BROOKS, A. M.

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Rooms of the Md. Institute of Education,
March 10, 1843.

Dear Sir—

At a recent meeting of the Maryland Institute of Education, the following resolution was unanimously adopted:

"*Resolved,* That the thanks of the Institute be returned to N. C. Brooks, Esq. for the very able and interesting Lecture delivered by him, on the 1st inst. before the Institute, and that the Recording Secretary be requested to solicit from him a copy of the same for publication."

In communicating the foregoing, I discharge an agreeable duty, and sincerely hope that you will comply with the wishes of the Institute, expressed in the latter clause of their resolution.

With great respect,

Yours, &c.

AARON B. HOYT,
Recording Secretary.

N. C. Brooks, Esq.

High School,
Baltimore, March 11, 1843.

Dear Sir—

It is peculiarly gratifying to me to learn that my late humble effort before the Maryland Institute of Education, has, in any way, met the approbation of that body; and I am duly sensible of the honor conferred on me in the request which has been made for a copy for publication.

Whatever estimate I may put upon the Lecture, myself; and however I might have preferred, that the funds devoted to this purpose, had been appropriated to the furtherance of other objects of the Association, I do not feel at liberty to withhold it; and accordingly place it at your disposal, with the regret it is not more worthy of the kind consideration with which the Institute has been pleased to regard it.

I am, dear sir,

Very respectfully, yours,

N. C. BROOKS.

A. B. Hoyt, Esq.
Rec. Sec'y Md. Inst. of Education.

MATTER, INSTINCT, MIND:

THEIR

NATURE AND RELATIONS.

When the "Schoolmaster is abroad," or at home within the walls of his Academy, it is his duty to *teach.* I have selected, therefore, for this evening's entertainment, a subject more likely to afford instruction than amusement; and suited rather for the conveyance of thought, than the embellishment of mere words. And in the reflections which I have to offer upon it, I have sought to adopt, as best for a mixed audience, a happy medium between the attainments of the man of science, and the common reader; just as a skilful gunner, who would shoot the farthest, takes an angle of forty-five degrees, in his aim.

Tradition and the dim rays of human reason cast upon the minds of the ancient philosophers the dim shadows of a Deity. In the regularity and splendor of the heavens above—the symmetry and beauty of the earth around them, and the myriad wonders of the deep beneath, they recognized a God; but that God was the Theos or Deus—the Disposer of the Universe, rather than its Creator. They could imagine a great Architect whose skill had fashioned the whole, but their unassisted reason could not rise to the contemplation of a Power to create the material, out of which all things were made. They held the matter, therefore, to be uncreated—eternal like God himself; it being the passive, and he the active principle or plastic power that moulded all things.

There were other ancient philosophers who sought to account for the visible world, without the intervention of a first cause,

at all,—whose doctrines of fortuitous atoms were like the mad theories of the philosophic Lucifers of modern times, who assail the throne of the Creator and God of the Universe. These modern skeptics tell us that, at first, minute particles, agglomerated in the water, and pervaded by caloric and electricity, were expanded and formed cavities and produced irritation that became a vital excitement. This vital excitement they say, being sustained by nutriment acquired by absorption, caused wants aud desires in these lower organizations, the impulse of which developed membranes, fibres, canals with their fluids and bones, successively; till with the development, progress and perfection of organs, a molecule ascended by gradation through the vegetable and animal kingdoms, till it became a man. 'Tis in accordance with this theory, Lord Monboddo tells us, in his philosophy, that Man, who is but little lower than the Angels, and was made in the image of God, is a mere gradation of the animal, a higher species of ape, not long since found in Nicobar, that in their transition, have cast their tails.

A few questions serve to show the fallacy of a fortuitous creation. How could inferior animals, destitute of the senses of taste, hearing or sight, conceive of such things, to desire them, when we, with our fine senses perfect, are unable to imagine a sixth? But again: who was it that gave law and motion, and these appetencies to matter, by which they propose to account for the creation of all things?—or farther still; who formed the matter of which they were made? The answer is obvious. It remained for Revelation, then, to disclose him who, alone self-existent from everlasting to everlasting, by the word of Omnipotent, from nothing spoke into existence the Matter out of which he formed the Heavens and the Earth, with the innumerable denizens that people their domains.

The Bible therefore, though at times accommodated in its diction to the prejudices of men, is the foundation of all true philosophy; the first Chapter of Genesis gives the only origin of the universe; and provides Faith with a telescope which, above the things of Earth—beyond suns and systems—discloses the dread BEING OF BEINGS, who sits upon the throne of Eternity—at once the Creator, Disposer and Controller of MATTER, INSTINCT and MIND.

Many wise and good men, however agreeing in relation to the facts recorded in the Genesis of Moses, differ in interpretation of time—some supposing the creation of the Earth long anterior to that of man, and the term days an indefinite period—while others consider the Creation of the Heavens and the Earth—with their inhabitants, as effected in six regular days. It may therefore be merely observed, that in the history of the Creation of things, as recorded in Genesis, we perceive a regular gradation upwards from inanimate matter to man, all of which is exemplified in their organization—first the Earth—then grasses—then herbs—then trees—the moving things of the waters—the fishes—the reptiles, birds, beasts—and, lastly, man the terrestrial Lord of Creation. Whether these creations preceded each other by intervals of ages, and were, each in its turn, made the basis of what succeeded, or were separated and distinguished merely by ordinary days, one thing is certain—that each several creation is higher than the one anterior to it. And however with Geologists we might be disposed to admit their views of an earlier Creation of the Earth (although the phenomena on which they found this theory may be otherwise satisfactorily accounted for) it would seem to deprive the system of Creation of much of its harmony; and to circumscribe, at once, the power and the glory of God, were we to suppose the after formations of the different tribes of vegetables and animals, occurred severally at intervals of ages.

Under the name of MATTER is comprised whatever occupies space, and is cognizable to the senses. It is consequently the substratum of all bodies having extension. The elements of matter, out of which all things are formed, are about fifty in number. Matter is either INORGANIC or ORGANIC. Inorganic matter is an accumulation of particles of the same, or a combination of those of different elements—without definite form, and without life and motion;—in a word a collection of homogeneous parts, each of which has the properties of the whole. Thus a drop of water is as perfect as a hogshead of the same fluid; and a particle of iron has all the characteristics of the bar from which it is filed—a striking difference to what occurs in organic life where a portion of a vegetable, as the root or the trunk; or a part of an animal as the head or the body, cannot

be regarded as a perfect entity, but as parts of a general whole. It is evident therefore that our globe with the rocks, stones, metals, earths and fluids it contains, comes under the name of inorganic matter;—yet has this glory that it not only affords a theatre for the display of organic life above it, but furnishes the material out of which the organisms are formed; for vegetables and animals are all formed from some of the simple elements to which we have referred.

I have said that inorganic matter is without definite size and form, and without life and motion—yet we see an approach to the former in the crystallization of metals and of the gems that Nature has hoarded in her secret mines; and analogues of the latter, when in passing from unstratified to stratified rocks, we meet with the appearance of veins. Aristotle and others were disposed to regard the ultimate particles of matter as animated points or monads—(a theory which some philosophers are at present reviving); and in accordance with these views, considered the earth a vast moving, breathing animal or rather aggregation of animals. However averse to endowing our bountiful mother with the actual attributes of life, we may readily admit the analogies of it, in her structure and her functions. Thus the rocks of the earth may be considered as her bones, the ground as her flesh; and the waters as her blood. The enormous chains of granite that extend through her whole length, may be regarded as the vertebral column or back-bone; and the smaller mountains as limbs. The Ocean is her mighty heart. Its pulsation is felt in the ebb and flow, that are its *systole* and *diastole*—and sends abroad the blood-like fluid, which is conveyed back to it again, by the vein-like rivers. The internal cavity within, where heat renders every thing fluid, may be regarded as the stomach. It has pores for absorption and respiration; and its fiery breathings may be seen from the nostrils of volcanoes, which serve also for emunctories. And though destitute of a head proper, like a Polypus or Tunicary, yet Symmes' hole, when discovered, will be a huge mouth fitted for absorption, like the mouth of a Rotatory. As all animals have their parasitic vermin, we may conclude the analogy by considering men and animals as the parasites of the Earth.

Thus, in tracing matter through its gradations, it will be found that each lower kingdom is not only intended for the support of that which succeeds it, but presents as it were the shadows of its advancing forms and functions. Inorganic matter, therefore, which is at the foot of the scale, is the support of the vegetable kingdom, for no animal substance unless decomposed and reduced to its original elements, can form a part of the nutriment of a plant—vegetables are intended for the sustenance of graminivorous animals—these again for the carnivorous, and all are for the use of Man who is the acknowledged Lord of the whole. And the structures and attributes of these several kingdoms, follow each other with a wonderful regularity—each filling up as it were the perfect picture, of which the preceding kingdom presented a faint outline.

Organic matter is a term applied to bodies of heterogeneous elements, and heterogeneous parts which, though separate and distinct, have a mutual relation and dependence. These bodies have determinate size and shape; and the parts or organs, have within themselves certain motions or functions which, taken together, are denominated life. The lowest division of Organisms is vegetables. Not intended for self-enjoyment, they are without sensibility; and, consequently, have not occasion for powers of locomotion, to avoid pain or seek pleasure. Designed merely to sustain animals, and to delight the eye and serve the purposes of man, such organs only were necessary to them as were calculated to nourish the individual, and to continue the species—accordingly we find in their economy, provision made for nutrition and reproduction only. In these, however, approaches are made to the animal kingdom, as will be seen hereafter.

In comparing the most beautiful gem from the mineral kingdom with the delicate tintings of the corolla, or even with the leaf, of a vegetable, the superior rank of the latter, in the system of nature, will be evident. How interesting then to trace the different vegetables, from the short-lived flowret to the olive of centuries, and from the simple shrub to the giant Banyan, beneath whose boughs nations have worshipped; while, as the day-god departed the fire-flies lit the dim aisles with their tapers, and the Campanillero or convent-bell-bird, with his solemn toll, announced the hour of vespers; but we hasten on to higher

organizations. Vegetables, having occasion, like animals, for something to stand upon, have analogues of feet, in their roots; but as they have no occasion for locomotion, these roots are firmly implanted in the soil. The trunk and the branches, being similar to the body and limbs of animals, find their support in the hard, woody fibres which supply the place of bones. The branches are sometimes possessed of claspers that serve as hands. A regular circulation of sap is carried on, similar to that of the blood in animals,—by means of vessels which convey it from, and to the root, like arteries and veins. This sap is carried to the leaves which aerate it like lungs, and then distribute it for the sustenance of the plant. Vegetables have neither mouth nor stomach,—but nourishment is taken up by the roots, and being assimilated, after the manner of food in the animal stomach, passes through glands which secrete the juices required for the economy of the vegetable. They have also tracheæ or air vessels, absorb air and moisture, and throw off unnecessary and hurtful particles, by excretion. Nor is this the only resemblance—the pith of the trunk is like the marrow of the bones, and the rind of trees, with its layers, corresponds in character, to the epidermis, rete mucosum and corion of the animal skin; while the prickles and the down upon it, further correspond to the provision made against external violence and elemental inclemency, in the spines and hair of animals.

The arrangement of the woody fibres in vegetables, is diverse also, like that of the bones in the next kingdom—thus the solid portions of the elder, are external, like the shell of a Molluscan, while those of other trees, are like the internal frame-work of the Vertebratæ. Some vegetables like the lower orders of animals, are without limbs—others are without leaves. It will be recollected that leaves serve the purpose of lungs; and when there are no leaves for respiration, as in the case of mushrooms, we find gills which perform that office—just as in fishes, which are destitute of lungs, we find gills to supply the deficiency. So far regards nutrition—the well-being of the individual.—For continuing the species, nature has provided sexual organs of reproduction—both male and female, corresponding to the economy of the animal world; and what is more wonderful still, in the lower orders of vegetables, the sexes are often united in one in-

dividual which is consequently endowed with suigenerant powers:—in a higher grade, though they are bisexual, there is a necessity of union between the hermaphrodite flowers; while in the perfect vegetables, the sexes are distinct in separate individuals. In all these phenomena of reproduction they agree with the ascending orders of animals. We have seen that vegetables are without sensation and voluntary motion; yet in the highest organizations, there is something analogous to sensation and reflection, which indicates an approach to animals. The Bengal Hedysarum is ever moveable, the Heliotrope follows the sun—Tulips fold their leaves and the Tamarind closes upon its fruit, at sunset—the Lotos sinks into the water; and the Scotch Sycamore shuts up its leaves, before a storm—the Nepenthes distillatoria of Japan, extends its pitcher during a rain, and, when it is full shuts down the lid—the animal flower of St. Lucia, an aquatic somewhat resembling our marigold, sinks down into the water, when the hand is presented to it; and the Sensitive plant shinks back and shrivels up, when it is touched:—there is another peculiarity in this plant, it has regular joints that play like those of the Articulatæ or Vertebrates. The leaves of the Dionæa seem as if formed to catch food: whenever an insect settles on it, the parts are irritated, and the lobes close upon it, and crush it to pieces. In some plants also, there is something like sleep. When the sun has gone down, and darkness has overspread the earth, their limbs are relaxed, the bright eyes of the daughters of the fields, are closed, and their queenly heads, bowed in weariness, are rocked to sleep by the gentle breeze, while some that have shunned the light (as the Nyctanthus) come forth like melancholy wanderers beneath the moon, to look upon the stars, and pour the soul of sorrow upon the dewy air. All these phenomena however are but analogies of animal sensation and may be explained on the principles of light, electricity and chemical attraction.

Rising above mere vegetable life, we come to a higher division of organic matter, ANIMAL EXISTENCE. The preservation of the individual and the species being an object here, as in the vegetable kingdom, animals in common with vegetables are provided with organs for nutrition and reproduction. However, as the food of plants is inorganic matter; and the food of animals or-

ganic, consisting either of vegetable or animal organisms, it is necessary that the nutritive apparatus of the latter, should be of a higher order—which is accordingly found to be the case. In the growth of animals, there is this farther difference—the number and the position of the limbs, are determinate; while those of vegetables are not. The order of the nutritive and reproductive organs is also reversed—thus the head and mouth of the perfect animal, are superior; and the reproductive organs inferior—while the root or mouth of the plant by which it is nourished is in the earth, and the flower by which it continues its species, is at the top. This position of the head, in the animal, at once proclaims a design superior to mere vegetative existence—to wit, sensation, which has its seat in the brain. The principal object in the creation of animals was enjoyment. Hence they are not only fitted for nutrition and reproduction, but are endowed with sensation, with which, in the benevolent economy of the Deity, are connected perception, and powers of volition and motion: for the sensation of pleasure or pain, must necessarily affect the will to seek the one and avoid the other, by means of motion. The construction then of the members of this department of organic life, is not only well adapted nutrition and reproduction, but to sensation, perception, volition and motion, all rising both in kind and degree, with a beautiful gradation through the ranks of animal existence, in a manner suited to the character and condition of each order. This will be apparent as we proceed to lift link by link of the great chain of being.

Of the class of ZOOPHYTES, which claim, at once, connection with two worlds—the Vegetable and the Animal,—first are the Porifera or Sponges—those animal mosses that encrust the ocean rocks, or depend, in living stalactites, from the arched grottoes of the far-down sea. These are like vegetables outwardly; but contain within a soft flesh mixed with fibres. The numerous pores of the sponge, like capillary tubes, take up, for the sustentation of the animal, the water with the small particles which it contains; and this is expelled again through larger passages by a contractility within. Its motions, it will be seen, depend to a considerable extent on the element in which it lives; and in mechanical contrivance, are but little above those of dead matter.

It has no power of locomotion but is permanently fixed at its base like a plant.

Next in order to the Porifera are the Polypi—those living flowers that expand their bright petals amid the parterres of the sea. Like a bud at first, they attach themselves permanently to a rock, rear a trunk and send forth branches, which produce beautiful flowers somewhat like the china-aster. The centre of the flower's disk, is an orifice, which is the mouth of the animal; and the long petals that surround it, are tentacula which serve to seize any thing and bring it to the mouth. By the play of these tentacles in the water, eddies are formed, which (without design on the part of the animal) draw minute particles for its sustenance. In this arrangement for food, in which for the first time we are presented with something analogous to hands, it is plain that the Polypi, in contrivance and muscular power, occupy a higher state of organization than the Sponges. Still they have many characteristics of vegetables. Like them, they are permanently fixed, like them they turn towards the light; and, like them, are indeterminate in the form and number of their limbs; and replace them again when lost. But especially in their reproduction are they like vegetables. They may be propagated, either by buds, or by cuttings from the living branch, whether these cuttings be made transverse, longitudinal or otherwise—having we suppose animated molecules that, like the eyes of the Potatoe, insure reproduction.

An interesting order of the Polypi is Corallines, those animal architects that lay their foundations in the bottom of the ocean, and rear their ruby structures curious as the Labyrinth and higher than Babel of old, till they form the crust of islands and continents in the sea. They are shown to be a higher order of existence, by having, in their structure, something analogous to the Molluscans; and even of the Vertebrated animals, when the polypary is jointed and enveloped by the polype.

In the last and highest order of the Polypi, for the first time, we meet with the power of locomotion. A beautiful species is a phosphoric animal, called the Pennatula,—"the only literary Editor" of the deep, the motion of whose pen like that of the true literateur, flashes radiance as it moves. The Sea-pen consists of a long calcareous tube, like the cylinder of a quill,

surmounted by a plume. The fibres of the plume on either side, are composed of polypi and the minute filaments of the fibres, are their tentacula or arms, by the simultaneous stroke of which, this singular community is rowed through the water. The power of moving from place to place, is not the only distinguishing trait of the Sea-pen. Its manner of reproduction is wonderful—being by means of oviform germs sent forth from the mouth.

Next in order we come to a class of animals called Infusories —animalcules sometimes not more than the 20,000th, part of an inch in length—that inhabit fluids in general, and almost all animal and vegetable substances. Infusories are commonly placed at the bottom of the list of animals, which is inconsistent with their vitality and muscular power. These animals differ from the Polypi, in being separate, and in having the power of locomotion. They are sometimes called amorphous because their form is indeterminate or changeful, and their structure various; but all have the power of active locomotion, which shows the prevalence of muscle. A higher grade of the Infusories is called Rotatories, because they have circular discs surrounded by *cilia*, (certain appendages like eyelashes,) that appear to be forever revolving. The cilia serve the purpose both of arms and feet—at once propelling the animal by their rotation, and forming eddies which cause food to flow into the mouth. They show a much higher organization than Polypi—for while most of the Polypi have a mere orifice for a mouth, and have so little the mechanism of a stomach, that they can be turned inside out and yet digest as before—the Rotatory Infusories have mandibles, sometimes armed with teeth, several stomachs, and even rudiments of a nervous system. Yet they retain so far the character of vegetables as like them to be produced by cuttings.

The next class of Animals is Radiaries, which, unlike the Infusories, are limited in growth and shape to a certain standard. They are called Radiaries because they diverge like rays from a centre. We saw a tendency to this in the preceding classes, but here we find perfect radiation in form. There is also an approach to the formation of nervous centres—and consequently as a class they cannot be produced from cuttings or offsetts, like Polypi and the higher Infusories which have nervous molecules

diffused generally over their bodies. The different orders of Radiaries, are Gelatines, of a soft mass like jelly—Asterias those living stars that spangle the ocean firmament, and Echinoderms with spines like the hedgehog. The Gelatines in shape resemble an umbrella, or if we look for an analogue in the vegetable world, the mushroom, and are carried, by the wind and their own movements, over the water. The Star-fish send forth rays from which tubular tentacula issue that have a three-fold use; and serve at once, as feet for locomotion, as hands for seizure, and as lungs for respiration. They have an arrangement which answers the purpose of teeth. The Star-fish may be propagated by cutting off a portion of any of the rays, which shows their vegetable connection. The Echinoderms have projecting spines, that serve both for motion and defence. These shafts are of a violet colour, and fluted like a Corinthian pillar, with regular pedestal and capital. The mouth of these animals is better formed than any of the preceding; and has well-defined teeth. Their internal organization is also more perfect—the alimentary arrangement is much better—nervous nodules are found and ovaries. Occupying, at the same time, ocean and the air, a higher organization becomes necessary; and accordingly we find a development of organs, to serve the purpose of respiration of the air.

The next class of Animals is Tunicaries, so called because they are enveloped in a double tunic or mantle—the exterior one hard and having oval and excretory apertures—the interior soft with apertures accommodated to those of the exterior ones. They have gills for breathing, traces of a heart in an apparatus somewhat like a pump—an alimentary canal—and although headless they have a ganglion or nervous agglomeration, that sends nerves to the mouth and posterior extremity. Some are simple, others are aggregate—fixed or floating—pointing back in these respects to the Polypi whose type of sociality and permanent location, is found in the vegetable kingdom. The Salpes and Pyrosomes are remarkable orders of the aggregate Tunicaries. The former as they are carried over the water roll and unroll themselves like ribands of fire; and the latter, lighting up the ocean as they sweep along, exhibit in their changing colors all the iridescence of the rainbow. Of the *simple* fixed

Tunicaries, the Cynthia Momus is the most remarkable; of the floating, the Velella and the Physalia or Portuguese man-of-war. They have thin membranes which they can elevate. These serve as sails; and nothing can be more beautiful than a fleet of these mimic line-of-battle-ships skimming the deep, with their purple canvas spread to the wind.

The Molluscans are the next class, and are evidently higher from the fact that their organization is more perfect, and from the circumstance that some orders of them are found on land as the snail and the slug. The body of the Molluscans is soft—enveloped in a bilobed mantle somewhat like the Tunicaries; and the whole surrounded by a calcareous shell whence the name Mollusca. In their formation they appear to forecast the class of Insects for the valves of the shell correspond to the *elytra* or exterior wings of the insect, while the mantle within, answers in a measure to the soft interior wings. They have gills for respiration—a heart with its functions—and although no medullary chord for nerves—yet ganglions that send them to different parts of the body. The bivalve Molluscans, or those which have two shells, are headless. Some of them, however, have a foot better developed than any we have hitherto seen of extraordinary power; and eye-like organs or tentacula, that supply in some measure the want of vision.

The bivalve Moluscans form two divisions, the first comprising those that live in the mud, or burrow and form cells, and the second embracing those that fix themselves to stones or other substances, by a tendinous ligament thrust through the shell or by a byssus which is spun by the foot. Of the first division of Bivalves the common Oyster is most generally known; the peculiarities and excellence of which require no description in Baltimore. The Pearl oyster is the most precious, forming by means of a lapidifying fluid an animal gem that rivals the most beautiful crystallizations of the mineral world. Of all these shells the Pecten or Comb-shell is the most beautiful in sculpture and in coloring, but perhaps the most remarkable of the Bivalves are the Stone and Ship borers, which planting themselves firmly on a muscular foot revolve, and like an auger bore through the bottom of ships, and into the most solid stones. The Pholads or Raspers are scarcely less worthy of note and

have shells like a file, which moved backwards and forwards by means of the muscular foot, abrade away the hardest rocks. Of the second division of Bivalves the Clampshell is the most distinguished. It is a giant shell weighing sometimes five hundred pounds, and is often suspended from rocks by means of tendinous fibres put forth through a large orifice situated not far from the hinge of the shell. The Pinna or wing-shell, so called from its resemblance to a plume, belongs also to the second division and is distinguished for the production of a byssus spun by its foot, which was anciently manufactured into gloves and stockings. As this byssus terminates in a sucker, the animal often uses it as an anchor and cable to stay itself amid the violence of a storm. The bivalve Molluscans are all hermaphrodites—that is each has both sexes and produces of itself—the common oyster is so prolific as to be said capable of producing ten thousand barrels.

Univalve or one-shelled Molluscans, from the position of the foot, are called Pteropods, Gastropods, Trachelipods, Heteropods and Cephalopods—that is wing-footed, belly-footed, neck-footed, diverse-footed and head-footed. In Univalves, for the first time, we meet with a regular head, and this in the first order is imperfectly developed. The Hyalea with a beautiful transparent shell, belongs to the Pteropods. Through apertures in its shell, it puts forth two large, yellow and violet wings; and sails over the water—the butterfly of the ocean. The Chiton or Coat-of-mail shell is the most remarkable of the Gastropods; often fixing itself to rocks or the keels of ships, and by means of a vacuum which it creates, rendering it impossible to rend it away without breaking the shell.

Of the Trachelipods the Snail is the most remarkable. It has an appearance of eyes—indicating the development of those organs in more perfect Univalves. Snails are herbiferous. Their courtship is very classical—they are said to throw winged Cupid's darts at each other, as a sign of a mutual flame. The young are produced from eggs, and the infant animal feeds upon the skin of the egg from which it was produced—just as birds live on the yolk or frogs on the white. Carbonate of lime is a chief ingredient of this skin; and it is necessary for the young animal to feed upon it that it may have material for the formation of its shell: just as gravel and dust are necessary to fowls

for the same purpose. The Snail is a hybernating animal. When winter comes it forms a kind of mortar by mixing earth with a mucus which it secretes, and, using its foot as a trowel, builds a structure round its shell, in which it passes the winter. Snails are hermaphrodites—but as there are male and female hermaphrodites among them, they are produced by a union of these. Some of the Trachelipods are carnivorous which may account for their having eyes and ears, as these are necessary to enable them to see and hear their prey. We find these developments of eyes and ears in the Stromb, the Murex or purple dyefish, and the Cowries, a very beautiful species of which forms the specie circulation of some countries into which shinplasters have not yet found their way. The carnivorous Trachelipods have two distinct sexes, and male and female shells, in which also they are followed by the Heteropods.

The Heteropods have a proboscis, two tentacula and four swimming apparatus. The Carinaria vitrea, having a shell of great transparency and extreme brittleness is a good representative of this order.

The Cephalopods or head-footed Molluscans are the highest order, and seem to occupy a middle ground between the Polypi and the Vertebrates having the tentacular of the former, the visual and auditory organs peculiar to the Molluscans and the beak, tongue, and something like the osseous column, of the Vertebrates. The Cuttlefish, that like a hyena prowls at night through the waters, and terrifies the fish with its great flaming eyes, is the most predaceous of the Cephalopods; as the Nautilus is the most beautiful, who in his pearly bark, with his canvas spread to the wind and his tentacula for oars, sweeps over the sea, like a Tyrian galley with its broidered sail.

We begin now to emerge from the ocean. Occupying a place between the Mollusca and Vertebrata, is a class of animals called Articulata; because they are distinguished by having regular joints. The first order is that of Vermes or worms, called annulose animals, because they consist of a frame-work like rings, connected together by bands of muscular fibres, the contraction and expansion of which, give motion to the animal. This order is subdivided into five genera distinguished as follows—those that have no bristles or cavities of prehension, as the Earthworm—those that have a cavity at each end for prehension as the Leech—those with bristles to assist locomotion but without

legs—those with legs, and bristles armed with a claw—but without heads—and lastly those with head, eyes, and proboscis armed with maxilla or jaw-bone.

The next order of Articulata is Crustaceans—or Shell fish—a race of animals whose limbs are articulated with great skill and adaptation of parts—the whole of which are enclosed in a shell of carbonate of lime. To the most superficial observer it is evident that the organization is more perfect than any we have yet noticed; and that, in the character and arrangement of the different parts of the shell, there is an approximation to the bony articulation of the vertebrate animals. We need not particularly describe the order as all are well acquainted with the Crab and Lobster which are members of it. We have hitherto found something to serve the purpose of hands; but in the pincers of the crab, we have, for the first time, an initiatory development of the hand proper, in something analogous to a thumb and finger.

The Crustaceans are comprised under the name of Melacostracans or soft-shell—divided again into tribes, from the number and position of the feet, called Decapods, Stomapods, Læmipods, Amphipods and Isopods; and Entomostracans or those which have the shell scored,—somewhat after the manner of Insects, with which they are the connecting link. The most remarkable of the Crustaceans are the Hermit-crabs—the Soldier-crabs and the Horsemen; their history is full of interest.

Under the name of Insects we may include Arachnidæ or Spiders, though most persons make a separate class of them. Insects are a high development in the animal creation; and as active motion constitutes their chief enjoyment, we find their structure well adapted to rapidity of movement. It will be found that many winged insects have a more rapid motion than any other order of animals, their size considered; and it is perhaps owing to the danger to which this rapidity exposes them, that they have been protected by the hard integument which covers them. This hard covering is called entomoline; and the rich lustre of it is owing to the presence of metallic substances heightened by the reflection of the light. Though Insects have no spinal column with marrow, there is a spinal chord which runs along the back interiorly and terminates in a bilobed agglomeration somewhat like a brain. There is a heart and circulation with

a white fluid for blood—respiration by means of tracheæ—eyes varying from eight to two—ears in the more perfect insects at the bottom of the antennæ; and in the development of the head and the feet a nearer approach to the vertebrate animals than we have yet seen—as might be shown by particular specifications. All however exhibit remarkable design; and whether with tiny feet they walk the earth—with oar-like paddles skim the deep or spread their winged canvas before the breeze of the upper element, they excite our wonder and admiration. The metamorphoses peculiar to the insect tribe, and the arrangements made for their several states—would of themselves furnish a topic of most pleasing illustration.

These states are designated by the following names, the ovum, the larva, the chrysalis or pupa, and the imago or perfect insect; and are best represented in the Lepidopterous tribe or Butterfly. The egg which the butterfly deposites, soon becomes a Caterpillar—an unsightly worm covered with hairs and bristles, yet having within its outer covering the organs of its future development. After a time the caterpillar invests itself in a shroud and in the pupa state awaits a higher destiny. Bursting at length the silken investiture it sails through the air, a butterfly; and spreads those gorgeous draperies beside whose ground the richest *cardinals* seem dull, and before whose spangles the diamonds of the Esterhazy mantle, grow dim.

Insects are named mostly according to the number and position of the wings; thus Aptera, Coleoptera, Orthoptera, Lepidoptera, &c. In the lower insects the wings and feet are multitudinous, and are replaced when broken off—characteristics referring back to the Polypi. The more perfect insects however have not more than six legs and four wings. Insects are produced from eggs.

We have now arrived at the last Division of Animals the Vertebrata. These are the animals unquestionably which are said to have been produced by the Earth, in the first chapter of Genesis. In Vertebrates for the first time we meet with bone. The shells of the Crustaceans and Molluscans are formed of carbonate of lime; but the bones of animals, which are much harder, of the phosphate of lime, albumen and gelatine. However diverse the orders of this class of animals may be, they all

agree in this respect—the body is formed upon and around a jointed column within, called the vertebra or backbone, which is at once the support of the whole frame and the general axis of motion—furnishing attachment for the principal muscles which move the body. The spinal marrow which extends through this column; and which terminates in the cranium or skull, in a mass of nervous substance, is also the centre of sensation, by means of the nerves issuing from it. Hence the sensibility of this class of animals is much greater than of any inferior ones; for the nervous substance is not only more abundant; but accumulated in greater masses in the head.

As the lowest organization of animals is found in the water, so the lowest orders of the upper class are also found there. Fishes therefore are at the bottom of the scale of Vertebrata. They have gills for respiration, like some of the lower animals which we have noticed, but their construction is in some respects superior, the circulation of the blood is simple and the blood is red, but cold. Fishes are produced from eggs, impregnated by the male after deposition. The teeth of fish are harder and better formed than those of the lower orders. In the scales of fishes, in the pectoral fins and in the tail, which acts as a rudder, we find something analogous to the feathers, wings and tails of birds, with which order they are more immediately connected by the flying fish prospectively—just as they are connected, retrospectively, with the annalose animals, by the Lampreys.

The ear of fishes is dull, but the sense of smell is exceedingly acute—the most so of all their senses. The eye of fish resembles that of the higher animals, but its outer coat is harder; so that it has no occasion for the protection of the eyelid. A species of Boudians has a membranous valve, analogous to the eyelid; and the Periopthalmoi have a regular nictitant membrane, like birds. Fish in general are protected by scales which encase them like the plate mail of warrior knights; but some have particular means of offensive and defensive war. Thus the Saw-fish rips those that come near him, with his jagged saw —the Sword-fish drives home his trenchant blade to the vitals of some powerful enemy—the Gymnotus electricus mimics the lightning of heaven; and the Torpedo fires his submarine artillery; while the Flyshooter, like a backwoodsman with his

rifle, by projecting a drop of water from a long tube, brings down flies and insects. In the water there are some rare analogues of the world of man. Thus in the far-down sea, the Lyre-fish sports through the musical waters—the Tobaccopipe-fish reclines in a shady nook, with a pipe in his teeth, like an honest Dutchman taking his comfort, while the Razor-fish plies his trade; and with keen instrument shaves his customers where the Fancoral or the Dulse hangs out the barber's pole.

Reptiles constitute the next class of the vertebrates, and as they are amphibious, they are the connecting link between the fishes which inhabit the water, and animals that live on land. Although conformed to the higher animals in the texture of the flesh, and in the development of limbs; yet, in some respects, they might be regarded as below the fishes—for the brain is so exceedingly small, that the life, instead of centering there, appears diffused over the whole system—so that the removal of the head or even the heart, will not destroy life, for hours after. Their power of vitality is farther shown in their passing months in a torpid state, in winter—and even years without air or food; when, enclosed as we find frogs sometimes in trees, and even in rocks. Reptiles are produced from eggs without incubation. The heart has two auricles. The blood is red but cold; and the covering is various—sometimes soft—again hard and defended by scales.

Batrachia or frogs may be regarded as the first order of the Reptiles, because in their early developments, they have more the appearance of fishes—breathing the air by means of gills like them—and like them propelling themselves through the water. Frogs are unsightly in their appearance; but have certain peculiarities in common with Insects, a class distinguished for their beauty. The transformations of the former correspond to the metamorphoses of the latter. First is the egg, a gelatinous mass with a black globule in the centre—then a regular development of head, body and tail, like a fish—presently long tufts grow out from the neck which serve temporarily as gills, and, at the same time, to some extent for locomotion—after a time, arms and legs are put forth, the caudal extremity is cast; and Don John, in virtue of his new character, leaps upon the land. The toes of the frog correspond in number and appearance to those of man; but the hand has only four fingers.

Ophidians or Serpents are regarded as the second order of Reptiles; though the simplicity of their construction might seem to indicate a lower position. The only bones of serpents besides those of the vertebral column, are the bones of the head and ribs. In general, they have no feet, but move along by means of the action of the ribs and the scales. Some, forecasting a higher grade of animals, have rudiments of feet, concealed in their interior structure; while others, as the Boa and Python, have external projections armed with a claw.

Saurians are the next order and comprise the different kinds of lizard-like animals—up to the Crocodile. Rudiments of a sternum or breastbone, and of the extremities appear in the lowest genera; and the feet become well-defined—some having two and the more advanced animals four feet. The Crocodile exhibits for the first time a distinct neck; and has the thorax and the abdomen better distinguished than they have hitherto appeared. The bones of the neck are the same in number as those of the mammalia which are always seven; and the bones of the hind legs are much like the same bones in quadrupeds. A species of the Saurians, the Draco Volans or Flying Serpent seems connected with the birds. Its ribs are spread out and covered with a membrane to which flappers are attached. These when expanded look like wings, and propel the animal through the air.

The Chelonians or Turtles comprise an order somewhat anomalous; for the whole body is encased in a solid osseous structure—so that they seem to occupy the same place among Vertebrates which the Crustaceans hold among the Articulata. The ribs and the vertebræ of the Chelonians are imbedded in the solid osseous fabric of the Carapace or upper shell. This disposition of the ribs, and the shape and general character of the head and jaw appears to forecast the birds; which peculiarities, together with the appearance of the feet, that flattened in shape, evince some approaches to the human hand, we may regard as evidences of a higher organization.

The next class of vertebrate animals is Birds, those beautiful creatures that, like animated ships, sport upon our waters, skim the air above us, and enliven our forests and fields, by the richness of their plumage and the sweetness of their song. They

are distinguished from all lower animals by having warm blood, a more perfect circulation and respiration, and a more capacious brain. In their voice also they approach much nearer to man. Like him they have two legs; and as these are to serve the purpose of hands, they have several divisions varying from three to five, one of which however is assimilated in its construction to the human thumb.

We have likened birds to ships. The analogy is strong; for whether they move through the water or the air, it is by the resistance which those elements make to the stroke of their webbed feet or their wings, similar to what is made to the stroke of an oar. We find the body of a bird the analogue of the hull of a ship. The sternum is broad and rounded like the sides of a ship, and it has a long straight bone depending from it which is exceedingly like a keel. Birds intended to fly in the air, require a construction that shall combine lightness with great muscular power. Accordingly we find their bones all of the hardest material (phosphate of lime) cylindrical and filled with air instead of marrow. The feathers with which they are covered, are light and their horny tubes filled with air; and the muscles moving their limbs, are of extraordinary power. Different ornithologists divide Birds differently. Some have only three divisions, others no less than thirty-eight. The elemental division is the simplest,—aquatic—terrestrial—aerial. They are more commonly divided as follows, Waders, Swimmers, Coursers, Scratchers, Climbers, Perchers and Raveners, the peculiarities of which may be inferred from the names. The Ostrich, may be regarded as the connection between Birds and the Mammalia. The position of the eyes, so that each can see the same object—the motion of the eyelid—together with its being furnished with eyelashes—its resemblance to a camel in appearance and peculiarities; and its associations with beasts, as the zebra, and quagga—all entitle it to this distinction.

We have now arrived at the highest class of animals, the MAMMALIA—so called from nutritive organs denominated mammæ, which secrete milk for the sustentation of the young. The muscular, nervous and nutritive apparatus in this class of animals, are of a higher organization than in any of the preceding. Some of the mammalia are aquatic, some are amphibious, and some

terrestrial, with structures peculiarly suited to their several conditions and habits, yet all agree in having a vertebral column, with head and neck generally well-developed,—in having simple respiration by means of thoracic lungs, in having warm blood—in producing their young alive; and in nourishing them with milk from the mammæ—which, according to their position, are called pectoral, abdominal or inguinal.

The Cetaceans comprising Whales, Dolphins, &c. are the first order—and being the lowest are found in the water. Being aquatic they are assimilated to fish, in having a neck scarcely distinguishable; yet the fins are different in their location, and, when divested of their integuments, exhibit in the arrangement of the bones, the regular organization of human hands. In the hinder part of the trunk are exhibited bones which, in the higher orders, are regularly developed into the pelvis.

The Amphibia are the second order. They embrace the Seal, Walrus and Hippopotamus. The neck in these is better defined; and we meet with both fore and hind legs—which, in the case of the walrus, are divided into toes. All the orders above this have four legs.

The Ruminantia or those that chew the cud and live upon vegetables alone, have a less complicated arrangement of joints than the animals above them. They are a peaceful tribe; and, for the most part, seek safety by flight, for which they are well constructed. Some of them have positive security in the endowment of Horns, as the Ox, the Sheep and the Deer. The feet of all Ruminants are cloven.

The Solipeda, so called from having the hoof undivided, embrace the Horse, Ass, Zebra, and Quagga; which, though feeding on grass, do not chew the cud. These animals are intended for strength as well as fleetness; and accordingly the arrangement of the bones of the foot is altered to meet this design.

Pachydermata, or thick skinned animals, form the next order, and comprise the Elephant, Rhinoceros, Tapir, &c. Strength is the principal object had in view in the formation of these animals, and accordingly we find, that the limbs are placed almost perpendicularly, a position which is the best adapted for support. In the case of the Elephant, the legs being required at all times to sustain the huge fabric—they could not be used for purposes

of prehension or defence—and the head, from its immense weight, being connected to the trunk, by an exceedingly short neck, and consequently restricted to a small motive space, there was a necessity for a new organ to suit the purposes of prehension and defence, which accordingly we find in the trunk, which is at once delicately sensitive, and endowed with great muscular power; and is capable of being turned in any direction vertically, horizontally or towards the earth.

The Rodentia follow next and are distinguished by sharp cutting fore-teeth, with which they gnaw off vegetables, shrubs and even trees, as in the case of the Beaver. The fore-legs of the Rodentia, and indeed of all the succeeding orders, being required, not merely for progressive movement, but for seizing and holding, they are provided with a clavicle or collar-bone, attached to the scapula or shoulder-blade for the purpose of giving a more convenient motion to the limb in any direction.

The Insectivora, which order succeeds, have no fore-teeth but grinders only; for the purpose of crushing insects. Some of them as the mole have fore-arms that are large and flattened; and exhibit a concave curvature exceedingly like that of the human hand. We wish this regular approach to the human hand to be observed; for the wonderful mechanism of that limb alone; and its almost superhuman achievements in the varied conveniences of life—in the speaking canvas and the breathing marble—proclaim the frame of man above that of every other creature—and demonstrate that 'we are fearfully and wonderfully made.'

The Carnivora, consisting of the Plantigrada, or those which walk on the entire foot, as the Bear, and the Digitigrada or those which walk on the toes, as the Lion, Dog and Cat, have a more ample brain, superior acuteness of sense, and greater muscular power—all suited to their predaceous nature and necessary for entrapping and holding their prey. Their toes are five in number corresponding to those of man.

The Cheiroptera or Bat has a thin membrane extending from its anterior extremities to the posterior, which fits it for flying. The anterior extremities resemble the fingers and thumb of the human hand. It has its name from its winged hands.

The Quadrumannes or monkey tribe is the last and highest order of mere animals. They are called Quadrumanæ or four-

handed animals because their four extremities resemble hands. The general appearance of the Quadrumannes is more conformed to the human figure than that of any other animal—the brain is larger and better developed—the bones of the arms are more like those of man; and the hand is human, except that the thumb, the great mechanical organ of man, is but imperfectly developed; and its muscles are weaker. The posture of the monkey, too—being half erect—occupies a middle state between the horizontal position of quadrupeds, and the erect carriage of man, with which under the name of Bimana, he is the connecting link.

We have thus hurried through matter inanimate and animate vegetable, and animal; and after a review of the order, regularity and beauty of the whole, we may well pronounce every thing good, as the great Creator did at the beginning. But creation did not stop here. The crowning excellence of his work was not done. At his bidding the earth and the sea had brought forth their respective inhabitants—then He himself, with his own divine hand, fashioned the frame of man—the bones with their curious articulations—the muscles for motion—the nerves for sensation—the vessels with their various fluids; and breathing into it the breath of life, bade the pulses play, and constituted man a living soul; and gave him dominion over the fishes of the sea, the fowls of the air and the beasts of the field.

In symmetry and adaptation of parts, in beautiful rotundity of limbs—in gracefulness of motion—in softness and delicacy of flesh, in transparency of skin—in roseate beauty of the mouth and pearliness of teeth—in harmonious development of the senses—in richness of voice—in brilliancy of the eye—in the elevation of his countenance, which is formed at once to look abroad upon the Earth, his dwelling place, and upwards upon the Heavens—his destiny—and in the mysterious expression which thought spreads over the features, Man stands immeasurably above the brute creation—the incarnate image of his God. But it is not in this alone that he excels all other creatures. In his spiritual nature he is lifted farther above them, than he is in his physical; as will be seen when we come to contrast instinct with mind.

Under the name of INSTINCT we witness many operations of animals that are truly wonderful, exhibiting, by whatever means effected, great wisdom in design and skill in execution. We cannot but admire when we behold the bee agglutinate the wax for the construction of her cells—without scale or compass, form them in perfect hexagons,—store them with honey—conduct the general economy of her wonderful polity—and send out colonies from the parent state. Nor is the wonder less when we visit the curiously constructed hills of the ants. The busy hum of industry is there, and every thing is done in the most perfect regularity. We meet there with passions like our own—parental tenderness and paternal provision for the young—wars and slavery the consequence, in the persons of the vanquished—a prescience both of the coming winter and the coming storm—evinced by laying up food for the former, and at times removing it, from fear of the latter. In the arrangement of the nests of birds in general, we see this skill displayed—especially in that of the Oriole or Baltimore bird—in the nest of the Tailor bird, which is formed by the skilful artist's sowing leaves together, using her bill for a needle and fibres for thread; and in the nest of the Loxia of Bengal, which is formed of two or three apartments, and lit up by lamps formed of fireflies. We recognize this mysterious impulse when the Armadillo forms itself into a coil and rolls down the highest precipices, to avoid the hunter—when the Drumfish, endangered, inflates his great drum, and presents, in his huge rounded and tense form, a mass that can neither be swallowed nor bitten through. We see it when the Antlion forms his huge funnel of loose earth, and sits, like the Tyrant of Syracuse at the huge prison ear, to catch the slightest noise of his approaching prey. We see it in the balloon which the Land Spider weaves to waft him through the air, and in the diving-bell in which the Water Spider explores the depths of the waters. In the motions and migration of animals we observe it—when the Salmon and the Herring come to the rivers from the sea; and when, without chart to guide them or compass to direct their way, the Nightingale and Swallow seek the land of flowers, and the gregarious aquatics seek the regions of snows. We see it when the herds of Horses station their sentinels—when the Soldier-crabs move in solid column over

the plain, or the swarms of Locusts move in lines, with all the mechanism and regularity of an army, and, before encamping, send out videttes and engineers for selecting a place to settle upon, according to the most approved rules of castramentation. In a word we see it in all those actions which have for their object the nutriment and defence of the individual, and the preservation of the species, however these may be diversified by the peculiarities of the different animal tribes.

We proceed now to consider what Instinct is, and the laws by which it acts. Various hypotheses have been formed to account for it. Some have supposed all these apparent manifestations of mind in animals to be the immediate agency of the Creator; or, as the amiable Addison expresses it, that "God is the soul of brutes." If this were the case it would exalt the brute above man in the care which is bestowed upon it. But instincts are sometimes fallible, as when mother Goose sits upon a piece of chalk, mistaking it for an egg; and when the flesh-fly mistakes the carrion plant for a putrid carcass, and deposites its eggs in it. This cannot be reconciled with the idea of unerring Truth being their director. Others again—philosophers and good men, suppose an intermediate agency of angels and demons—the former inciting to good actions and the latter to evil. Thus the Ursina Phoca, a species of Seal, influenced by the former, exhibits great paternal tenderness to the young, while at the same time, incited by the latter, he acts the part of a brutal husband towards their mother, by beating her most unmercifully. Or, as a knowledge of this animal may not be common, we will suppose a case more familiar; a dog, impelled by a good angel, caresses his master, and, urged by a demon, bites a stranger; or the cow, under this diverse influence, very benevolently lets down her milk until the pail is full, and then malevolently kicks it over with her foot. This theory, I presume, in the connection in which it is stated, carries its own refutation with it.

Having seen that the actions denominated instinct, are referible neither to the immediate spirit of God, nor to the mediate spirit of angels and demons; it is necessary that we should account for them on other principles. It is evident that the more subtle matter is, the farther removed from the senses, and the

nearer it approaches the spirit, the more powerful it is. Thus any chemist will tell you fluids are more powerful than solids; and gases more powerful than fluids; and that the imponderable fluids light, caloric, electricty and galvanism, are more powerful than gases; while beyond these again, pure spirit is more powerful than the imponderable fluids. Intermediate between pure spirit and these elements and agents, a power exists which may be denominated the SPIRIT OF NATURE or SPIRIT OF LIFE. This all-pervading spirit, as an under agent of Providence, regulating the motions, changes and general phenomena of all things animate and inanimate, in a manner corresponding to their several natures,

> "Warms in the sun, refreshes in the breeze—
> Glows in the stars and blossoms in the trees;
> Lives through all life, extends through all extent—
> Spreads undivided, operates unspent."

In going back to inanimate matter we find instinct even there. It exhibits itself not merely in the attraction of aggregation, but in the affinity and antipathy of substances. Thus sulphuric acid has an affinity for soda, lime, ammonia and magnesia in the order in which they are named; but when combined with any one of these, will reject it, if either of the former substances be brought in contact with the mixture. In the formation of chrystals however it is more evident, for here it exhibits definite form. But it is in regular organisms that this Spirit of life or instinct, becomes most manifest, where in the seed of a plant or the ovum of an animal, it attracts matter, and acted upon by heat and moisture, assumes volume, and developes itself in roots, fibres and leaves in the case of the former; and in flesh, muscles and bones in the case of the latter. What is it but this spirit of individual life, which, exerting its assimilating powers, causes two seeds sown in the same earth, and imbibing the same light and atmosphere, to grow up into shrubs entirely different in shape, colors, juices and medical properties.

The spirit of life whether it acts in vegetables or in animals observes the following laws—First—After materialization in the seed of the plant or the ovum of the animal, there is a power of motion (in the animal the *punctum saliens*) which continues until it is separated from the mass in which it is embedded, and

becomes a separate individual—2*dly*—There is the assumption of definite form and progressive growth, until maturity is attained —when lastly, there is a provision for the continuance of the species. These particulars then in relation to motion, nutrition and propagation, are common to vegetables as well as animals—the only difference is, that the former being destitute of sensation—these operations are conducted more on the principles of inert matter to which vegetables have a nearer relation—while the same operations are carried on with animals, principally by means of their senses—which are acted on, somewhat after the manner of matter. Thus when terrapins hatched far from the water, or ducks, escaped from the shell, immediately seek their proper element, it is from no reasoning, no teaching whatever, but in consequence of a species of attraction between themselves and the water, like that of the magnet and the iron. The same reason will account in general for the selection of their food—they are irresistibly attracted to it. When in case of hunger the gastric juice attacks the stomach, or in case of thirst the absorbents, acting like a sucking-pump, and not finding liquid to act upon, cause pain—the instinctive feeling of want puts the animal in motion to seek food. Between the animal and its proper food, there is an instinctive sympathy which draws it to it—while an antipathy repels it from that which is hurtful. It is thus that cattle uniformly eat a certain number of herbs and reject all others; and it is this sympathy and antipathy which always enable sheep to distinguish at once salt from arsenic, which man cannot always readily do. It is this same influence, similar to that of the magnet in the mineral world, which enables the Reindeer to discover its proper food, though covered by the deepest snows. And this same will account for the hen's not being able to discern the difference between the chalk and her egg—because the chemical properties of chalk and of the egg shell (between which and herself there is some indubitable connexion), are much the same. The similar apparent error, where the flesh-fly mistakes the carrion plant for the putrid carcass to deposit its eggs in, is owing to this chemical attraction—for the plant has many of the chemical properties of the dead flesh.

Another remarkable fact in the history of instinct may be accounted for in the same way. The Sphex fabulosa always puts a spider in each cell, for its young to feed upon, and lays its eggs in the spider—now this apparently designed provision for its young may be simply the result of a kind of chemical attraction between the Sphex and its victim. When animals wounded heal themselves by certain herbs, it is also owing to this mysterious attraction. It is known that certain insects and fowls can prognosticate storms—Virgil, that acute observer of Nature, in the 1st Book of the Georgics, notices this and assigns the true cause too.

> Not that I think their breasts with heavenly souls—
> Inspired as man who destiny controls,
> But with the changeful temper of the skies—
> As rains condense, and sunshine rarefies
> So turn the species in their altered minds—
> Composed by calms, and discomposed by winds.

When we recollect that the earth and sky, are in different electric states before a storm of rain, we can readily imagine that insects and reptiles—partaking largely of the nature of the earth, should feel the force of the same electrical phenomena—and that fowls, filled to a very great extent by the atmosphere, in their quills, feathers and their bones, should like a storm-glass show the state of the weather. The same principle will account for the wonders of migration. Birds penetrated by the air obey its laws, and accordingly, as their nature requires a cold or warm temperature—follow simply the current of cold or warm air, and find the latitude suited to their natures. The pairing of birds and the hymeneal of animals, which generally take place in the spring, are owing to the genial warmth and fulness that are then flush throughout all nature. The migrations of fishes in the same manner are to be referred to the action of the element in which they live, and with which they are penetrated—obeying the impulses of their aquatic nature they are borne along by the currents, setting at one time towards the fresh water of the rivers and by the returning currents to the sea.

On purely physical principles it will be seen we have accounted for many of the phenomena of instinct. In relation to others we think there is great exaggeration. A certain fish, with tentacles around its mouth like worms, is said to hide its body and, make

these tentacles play; so that fish mistaking them for worms may be allured to it and thus be seized. The play of these tentacles is probably a mere motive recreation without any design at all—of course however, if prey did chance to be allured by it, the animal would seize them. The call of the Indicator Bird to the Honey Rattel and to man, when it finds a beehive, may be nothing more than a simple expression of joy—as the cry of the Rooster when he sees the hawk may not be a warning but an expression of fear. We are also told that the mocking-bird by imitating the voice of different male birds, calls their mates, and then mischievously frightens them with the scream of the eagle. In the varied exercise of its powers, birds, it is true, may be thus summoned and frightened; but it would be preposterous to suppose it happened by the design of the mocking-bird.

When insects form cells, birds nests, or beavers habitations, there is a higher development of instinct; yet all this is effected without any design, on the part of the animals, and without their knowing the nature of the materials which they use, or the definite purpose of their labors. They obey an impulse which is absolute and which they can no more resist or control, than a plant can resist its own growth. Indeed the only distinction between the natural productions of a plant, as its leaves and fruit; and the artificial productions of an animal as its cells or nest, is, that the spirit of life, in the case of the plant, by physical action upon the world below it, forms, itself, the leaves and fruit; while in the case of the animal the spirit of life not only forms the limbs of the animal, but also incites it to act upon the world below it again, and out of vegetable and inorganic matter to form nests, cells and huts. That these labors are the effect of a law of their nature, which they blindly and irresistibly follow—and are not to be attributed to reasoning faculties, may be proved by the following fact. The Caterpillar in the peculiar form and structure of the winding sheet it weaves for itself, provides for a shape and developments entirely different from those of its earlier existence. We cannot for a moment believe that, in addition to reasoning faculties for the present, it has also a prophetic vision of the future, and hence it remains for us to attribute all these things to the spirit of life or plastic power which works by means of the animal, and produces them.

This view of the case is again proved by the fact that animals are not taught to perform these works by their parents; but are born with capacities to do them. It is furthermore proved not to be the result of reasoning,—for there is no advancement—no gradual development—no progression from age to age—each taking advantage of the improvements of that which preceded it. Their forms, habits and productions—each nest and every cell—are the same as at the beginning of the world. The Tailor-bird with her ready needle, sews leaves together, probably with more neatness than Eve did the fig-leaf pantaloons of our great grandfather, but she has not yet learned to hemstitch or embroider, and she never will. The Beaver built huts, at the first, fully equal to the habitations of primitive man; but his structures will never reach the majesty of St. Peter's or St. Paul's.

The Nautilus, like an adventurous mariner, with oar and sail, skims over the sea; but has not yet learned to propel his bark by steam; and the Bombardier Beetle discharges his artillery, but he has not yet reached the excellence of Paixhan guns for point blank firing. The ants milk their aphides as we do our cows; but they have not progressed so far as to make ice cream, or Dutch or even common cheese. They have their black servants too, to wait upon them; but, in the advance of their civilization, have not reached that avaricious state, in which their slaves are colonized, and reared expressly for traffic.

The Baboon bears a walking stick, but he has not yet invented the graceful curve of the "Hooky" which supports the exquisite of the present day; and, though he may carry it as a defence he does not with murderous intent, sharpen it like the savage; and, in all probability, will never rise to the chivalry of sword canes that are borne by his congeners among the Bimanæ.

In the higher orders of warm-blooded animals—those that have five senses, and especially such as are carnivorous—their actions like those of man, seem more controlled by reason than instinct—so much so that we might almost be justified in calling it mind. Like man, the carnivorous animals are generally helpless at birth, and are, in some measure, taught by their parents—thus the cat teaches its young to mouse—the lion her cubs to hunt—and "the eagle stirreth up her nest, fluttereth over her young, spreadeth abroad her wings and taketh them on her wings and beareth them abroad." We find in these

higher animals, a gradual intellectual advancement as they grow older—their faculties evidently improved by the teaching of others, by their own experience, and often by the efforts of man; yet all this circumscribed by a limit which they cannot pass. Some of the higher classes of animals have not only an instinctive love of their young, which is scarcely known among the cold-blooded animals; but evince great power of memory, and even of higher faculties, of which the elephant, the horse, the dog, the parrot and carrier pigeon are striking examples. Many seem to exhibit feelings of humanity as gratitude, affection, anger, joy, sorrow and despair, of which many remarkable instances might be adduced.

It is hard to think that the tenderness of the fawn, which is a pattern of maternal love—the gentleness of the dove, which is a type of conjugal affection—the fidelity of the dog—the generous spirit of the war-horse whose "neck is clothed with thunder—who saith among the trumpets ha! ha! and smelleth the battle afar off—the thunder of the captains and the shouting"—should be destined to annihilation, especially as they were immortal at their first creation, since death was not in the world, and innocently lost their estate by the sin of man, to whom, though guilty, immortality has been again restored.

In the higher animals we find faint glimmerings that are as the twilight of MIND, but in man we find its true light; for he was made a "living soul." He has, it is true, the physical instincts of hunger, thirst, motion and the continuance of his kind; but these do not, as in the animal, irresistibly control his will; but are subordinate to it. He has not merely sensation and perception, like the animal, but apperception; and can comprehend, combine, compare, distinguish, reason, will and then execute.

The animal has inarticulate cries, or at most but voice, as in the case of some insects and birds; but man has speech, that glorious attribute of his nature by which the fleeting shadows of the mind become distinct and palpable corporeities. In the exercise of his mental powers, by means of this faculty, he clothes his thoughts with words, which like a mantle of light reveal at once and beautify the forms which they invest. The animal seems confined to the passing present—but man has a three-fold existence. By the exercise of reason and the senses,

he beholds and enjoys the world of life as it is spread out before him,—by the necromantic power of memory, he can call up the spirit of the buried past, and by the augur-wand of analogy and imagination, summon the shadows of the advancing future. It is the nature of instinct, in some measure, to control matter—but mind controls at once both matter and instinct. Man has dominion not only over earth and the elements, but over the fish of the sea, the fowls of the air and the beasts of the field.

All nature conspires to gratify his senses—the earth and the heavens unroll themselves in beauty to his eye; a varied feast allures his taste; fragrance breathes upon the air, and inanimate yet harmonious sounds, with the cries of beasts and the minstrelsy of birds, salute his ear. The earth yields its fruits, and animals their flesh for food, to fit him for labour; and, when fatigued by it, he finds repose upon a couch that their covering has provided. He arrays himself in their productions. The skin of the savage—the fine linen, broadcloth, the silk and the satin of civilized man, and the purple of kings, with the pearls and coral of the ocean, and gems of the earth, are all supplied for his use by the vegetable, animal and mineral kingdoms. Nor does instinct labor for man *actively* alone; as when the bee forms honey, or the silk worm spins its task—but *passively* also, when the ox turns up the furrow, the horse wheels the rapid car of pleasure or the chariot of war, and the camel and giant elephant carry their enormous loads.

The elements he not only makes subservient to his purposes, but even triumphs over them. By proper clothing he alters, as it were, the climate, and changes, by fuel, the inclemency of winter to the genial warmth of spring, and, with almost creative power, he says to chemical compounds, "let there be light, and there is light" that transforms the darkness of night to day. In pursuance of his designs of comfort and security, ingenuity has been busily engaged; and after the club, bow and arrows, man has invented the hammer, the axe, the saw, the furnace and the mill to assist him in his labors—gunpowder, also, and those

> "Mortal engines whose rude throats
> Immortal Jove's dread clamours counterfeit."

The various measures—the landmark, and coin the sign of exchange; and, binding the winds to his stately bark, or with the fire-breathing coursers of the steamship, by exchanging the

commodities of every clime, and thus making the productions of each zone common to the whole, he has reversed the decrees of Nature, and verified the prediction of the Mantuan bard:

"Omnis feret omnia tellus."

These things, however, concern man's physical wants and his selfish interests; but his mind is distinguished by nobler attributes. He has those social affections that consecrate Home by their sanctity, and widening in their sphere, give rise to the sacred love of country; and, expanded still again, embrace all that bear the impress of humanity, in the wide bond of a common benevolence. These social feelings inspire woman with those passive virtues that prompt conjugal devotion, and enable her to offer up all selfishness upon the altar of maternal love. These inspire the active impulses of man, when, as the father, he labors for his fireside and hearth-stone; or, as the citizen pours out his blood a solemn libation for the public weal. And these sustain the patriot in his love of liberty and country amid all the sacrifices and exertions he is called to make; and enable the philanthropist, in his love of man, to do and suffer, as he bears his message of truth and mercy o'er regions of endless snow, or the burning sands of the desert.

To guard his proprietary rights and these social privileges, man has formed polities and invented laws; and enthroning Justice on her tribunal, has committed to her hands the scales and the sword. Thus have risen successively the reverend policy of patriarchal authority, the proud domination of royalty, the splendors of aristocratic sway, and the mild majesty of republican rule, where man, in the true dignity of his nature, exercises his equal and unalienable rights. And in their public regulations—the decrees of the convocation and the court—the enactments of the senate and the hall, and the decisions of the forum, man has found a guaranty for the security of his person and possessions, and eats the fruits of his labour in peace, in the shade of his vine and fig tree, beneath the guardian care of the civil power at home, or in the protection of the law of nations, is wafted in safety o'er the deep, beneath that ensign, in whose foldings slumber the lightnings of a nation's power.

But the mind of man has higher aims than the gratification of physical wants and social pleasures. He has an innate desire for knowledge—an inward craving for an acquaintance with

the world around him. He loves to investigate the works of creation, and to search into the mysteries of his own spirit and of those that are superior. He requires Nature not only to yield her treasures, but disclose her secrets; and before the hammer and the fire, the retort and crucible, her elemental wonders have been laid bare. He has proceeded to investigate the nature and laws of matter and spirit, until the whole circle of the sciences has been evolved. He has not through skill compelled the earth merely to afford food for sustenance, but by a knowledge of herbs and minerals he has assuaged suffering and prolonged life. And when the spirit has departed, calling Galvanism to his aid, with Promethean power, he has, for a time, animated the lifeless clay. Having discovered the properties of the magnet, he has invented the compass, which, with a power like that of Deity, to whom the darkness is as noon-day, enables the ship to wing her pathless ocean way without moon or glimmering star. Weighing the air in balances, he has mounted the lighter chariot of the balloon, and like the fabled Dædalus, sailed through the air "pennis non datis homini." With infant Astronomy, Mind has gazed upon the stars from the heights of Babylon, almost burst the trammels of the flesh when, with Newton, it has lifted the telescope and peered within the vestibule of the Eternal, and has seemed endowed with the power of Omnipotence, when with Davy it has walked unhurt amid the fire-damp, or, with Franklin, has grasped the forked lightnings as a plaything, and smiled serenely at the thunders, as smiles an infant at its rattle. Man has invented the telegraph, and transmits thought along its iron nerves with the speed of electricity—to Time, that once glided by on noiseless wings, he has given an iron tongue and a finger that, pointing to the hours as they pass, reminds him of eternity—while for speech, a prominent characteristic of his nature, he has formed visible signs, those enunciators of his thoughts by which he can speak from pole to pole. These signs, by means of paper and the printing press, are the implements of History—perpetuate and extend knowledge, and, carrying light and truth, rouse man to a sense of his innate dignity, from the hovel to the palace, and bid Tyrants tremble on their thrones.

But further still, the mind of man, forecasting its destiny and developing its immortal powers, cannot be bound by the actual

world, wide and wonderful as it is—but revels in the regions of imitation and ideality. Thus rose the Sculptor's art and advanced in beautiful gradation, sublimating the human form, until Pygmalion wooed the production of his own chisel, and Grecian Superstition saw revelation reversed, in finding gods made in the likeness of man. Thus sprang Painting with its imitations of color, as well as of form, and the sister arts of Engraving and Lithography, with that mysterious process, of latter discovery, by which the Sun solidifies and stamps, as it were, the impalpable shadow.

To this ethereal action of the mind, we are indebted for the inspirations of Poetry—the solemn grandeur of Homer—the mellifluous sweetness of Virgil, the majesty of Milton—the wild imaginings of Dante—and the impersonations of Shakspeare. And to this we owe Music with its powers of exalting or subduing the soul—the sweetness of Hayden—the boldness of Beethoven—and the melancholy grandeur of Mozart, over whose strings DEATH almost relented, as he sung his own wild requiem.

But the wishes and aspiration of man's mind, do not stop here; he lives, not for time, but for eternity—and feels conscious that his mental and moral faculties, however developed and expanded here, are but in the rudiments of their existence, and that when his material part shall go down to the grave—"dust to dust"—his immortal mind, heightening in power, brightening in glory—shall ascend through higher orders of spirits—cherubim and seraphim and the whole angelic host that intervene between him and Deity, perchance making star after star its abode—till it reach the throne of Eternal and see God as he is.

Gentlemen of the MARYLAND INSTITUTE OF EDUCATION! You belong to a profession whose duty it is to nurture and direct the opening energies of the human mind—a sacred trust —a solemn responsibility. To you are committed in a great measure, not only, the interests of those under your care; but the well-being of society in general; for the impetus which you give to the opening faculties of youth are likely to continue;—your exertions form the moral orbits in which they are to move through life, diffusing abroad the mild and steady light of truth and virtue; or shedding dismay and pestilence, in their wild erratic course. And though your unobtrusive virtues be neither regarded nor rewarded as they should, take to yourselves this

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consolation and encouragement, that it is by means of letters and the labors of Teachers, primarily, that civilization with all its accompanying blessings, shall overspread the world.

Though your honorable profession may not occupy in the world, the rank to which it is entitled—though assemblies may not rise up to you, as they did to the ancient masters of the Academy and Portico; and though your stipends be doled out to you by Shillings instead of Talents, persevere in your laudable pursuits, let the peaceful sense of an honest discharge of duty be the guerdon of your toils, and know, that each day's labor, each hour's instruction impresses a power upon the mind, which shall be felt through the world, and reach even to the throne of God.

In conclusion—there was a time when, in all probability, the matter of which our Globe is composed, and all the suns and systems above us, were one mobile mass, which mass was disruptured by the word of Deity into innumerable portions that revolving in fixed orbits hence became round, and retained by the attraction of gravitation, have still continued their appointed motions. And in all probability a time will come, when the same hand which suspended the spheres, will again unchain them, and the Earth and all the planetary systems—each sun and star that glimmers through the dim distance of space—will be again united—and, purified by fire and expanded to immensity, be made a habitation for the CREATURES and CREATOR of the UNIVERSE. And in the exercise of the power and benevolence of God, who shall say that each beautiful flower and shrub that has fallen beneath the scythe of Time, shall not again lift up its head, for the decoration of the new world; and that each animal, which at the beginning was innocent, happy and immortal, shall not have its life renewed, when mortal man shall put on immortality; and that he, who with his angels did not scorn to mingle with Matter, Instinct and Mind, in the garden of Eden, may not again dwell with them, with the glorious assemblage of cherubim and seraphim; and thus ETHEREALIZED MATTER, SUBLIMATED INSTINCT and GLORIFIED MIND be gathered round the throne of Him, who is himself the Sun and Centre of MIND.

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